AUTOMOBILE INSURANCE RATES

In a discussion of the methods of automobile insurance rate-making it is essential to keep in mind that the measurement of risk in every branch of insurance has approached its present status by a series of improvements and that modern methods in personal and property insurance are a result of this progress. There is consequently no anomaly in the fact that in automobile insurance, one of the youngest branches of the business, a satisfactory system of rate-making still awaits development. The automobile was of comparatively slight importance prior to 1900; in the census of 1899 its manufacture was reported only as a part of the wagon and carriage industry.[1] Motor-car insurance was introduced in this country in the same year. In the early years of the business, furthermore, co-operation was rendered impossible by the competitive practices of many companies. Promiscuous rate-cutting was a prominent and disturbing feature of the business, and it was not until 1910 that the predecessor of the present association for rating liability and property damage risks was formed. Associated action as regards fire and theft rates appears to have been initiated only one year earlier.[2]

I. TWO FORMS OF AUTOMOBILE INSURANCE

Two practically distinct types of automobile insurance are written in the United States, one by casualty companies and the other by fire and marine insurance companies. The casualty companies issue "liability" policies, which indemnify the insured for his legal liability to others for their personal injuries; "property damage" policies, covering his liability for damage to the property of others; and "collision" insurance, compensating for any damage to the cars of the insured as a result of collision. The fire and marine companies' policies protect the insured against losses from fires,

[1] *United States Census*, 1910, Vol. X.

[2] *Investigations by the New York Insurance Department of the Automobile Underwriters' Conference and the Workmen's Compensation Service Bureau*, 1911 and 1913.

explosion, lightning, land and marine transportation perils, and theft or robbery. Property damage and collision insurance are written by both types of companies, with most of the former business going to the liability companies and most of the latter to the fire companies. The collision insurance contract usually consists of an endorsement upon a liability or fire and theft policy. Complete automobile coverage in a single policy is made possible by the co-operation of companies.

II. ASSOCIATIONS EMPLOYED IN RATE-MAKING

The rates for liability and property damage insurance are now made by the National Workmen's Compensation Service Bureau, organized in 1910. Prior to this date they were made by the Liability Conference and by companies independently. The National Workmen's Compensation Service Bureau is an agency for the promulgation of all liability and compensation rates, a portion of its attention being devoted to the automobile business. Its statisticians collect and prepare the data for rate-making, and their conclusions are submitted to an "Automobile Committee." While no absolutely accurate statistics exist, it is probably a tolerably correct estimate that 85 per cent of the liability business is done by companies which adhere to Bureau rates.

For the purpose of rate-making the country is divided into eleven sections as follows: (1) Greater New York territory; (2) Chicago and St. Louis territory; (3) Boston territory; (4) Philadelphia territory; (5) Providence; (6) Baltimore, District of Columbia, and Pittsburgh; (7) Detroit, Indianapolis, and Milwaukee; (8) St. Paul and Minneapolis; (9) the states of Alabama, Kentucky, and Tennessee; (10) Arkansas, portions of various other states, and certain cities; and (11) Arizona and other states.

Other automobile insurance rates, including those for collision, fire, theft, and transportation coverage, are made by the associations affiliated with the National Automobile Underwriters' Conference. The jurisdictions of these sectional conferences are shown on the accompanying map (Fig. 1). The committee in charge of rates is composed of representatives from the sectional associations. This enables an adjustment to local conditions, which

competition has rendered of prime necessity in the past, but which is detrimental to uniformity.

III. LIABILITY, PROPERTY DAMAGE, AND COLLISION RATES

Automobiles have been divided for purposes of rate-making into four groups: private pleasure cars, public vehicles, commercial motors, and manufacturers' and dealers' cars. The term "private

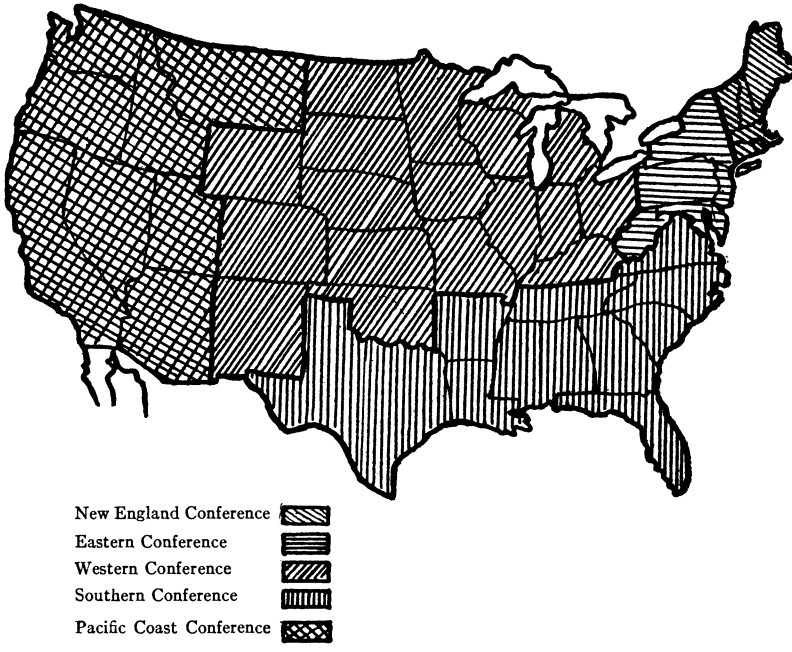

FIG. 1

pleasure car" is not exact, since it has been found advisable to include in this group cars used for professional and other work—for example, doctors' motors. Public motor cars include livery vehicles, taxicabs, sightseeing cars, and cars of the private pleasure type constantly or occasionally used for livery purposes or rented. Commercial vehicles are those used for the transportation of goods or merchandise—another definition which has been difficult of interpretation. Manufacturers' and dealers' cars comprise those driven primarily for demonstrating or testing purposes from factories,

sales agencies, garages, and stations. A distinction is also made between gasoline- and electric-driven cars. Space does not permit of a description of the rating methods employed for each of these classes of vehicles, and attention is confined to private pleasure cars because of their greater number, wider distribution of ownership, and consequent greater importance in rating problems.[1]

A. LIABILITY AND PROPERTY DAMAGE RATES

These forms of insurance have had common bases for rate-making and may be considered together. The factors which were assumed to be of consequence in the establishment of rates and capable of measurement are (1) motive power, (2) the territory in which the car is used, and (3) horse-power.

1. *Motive power.*—Electric vehicles have always enjoyed lower rates than gasoline cars and no distinction in rates on the former has been made because of horse-power, premiums being charged on a straight per-car basis. There seems to be no reason to criticize this discrimination between gasoline and electric cars or the per-car method of rating the electric type. Electric cars are usually capable of only a very ordinary rate of speed, are generally more conservatively driven, and are used extensively for social purposes. The probability of frequent and severe accidents therefore is considerably lower than for the gasoline-driven type. Table I gives a

TABLE I

Horse-power	Public Liability Insurance		Property Damage Insurance	
	Gasoline	Electric	Gasoline	Electric
16	$22.50	.....	$ 5.65	.....
40	66.50	$17.50	16.65	$4.40
60	86.50	.....	21.65	.....

comparison of the range of rates on gasoline and electric vehicles in Chicago and St. Louis. Whether a correct premium ratio exists between these two classes of cars is an unanswerable question

[1] For a popular description of rating methods for liability, property damage, and collision insurance on public, commercial, and manufacturers' cars, see the author's articles in *Motor Age*, March 23, 30, April 6, 1916.

because of lack of data. An appreciation of the statistical situation with reference to gasoline cars will make apparent the difficulty of arriving at equitable rates on electrics, for these are far less numerous and yield a more limited exposure.

2. *Territory.*—Rates have always been based upon the locality in which the car is principally used. The various rate territories have previously been indicated, and for the purpose of illustrating the influence of location on rates of premium a few jurisdictions will suffice. Table II shows the rates[1] in different localities on a 40-horse-power gasoline car. Two principal considerations have

TABLE II

	Liability	Property Damage
Greater New York	$83.50	$20.90
Chicago and St. Louis	66.50	16.65
Providence	54.50	17.25
Boston	54.50	13.65
Philadelphia	46.50	16.65
Baltimore and Pittsburgh	46.50	15.15
Arizona	44.75	11.20

brought about a territorial influence on rates: the great differences in traffic conditions in various cities and rural districts, affecting the probability of injury to persons and property, and in some instances the greater damages recoverable.

3. *Horse-power.*—The third factor in liability and property damage rating is the insurable horse-power, computed by the formula of the Society of Automobile Engineers, the premium rate increasing with the insurable horse-power. The latter may differ considerably from the advertised or actual horse-power of the car. Chicago being used for illustration, Table III shows the liability and property damage rates rising with the horse-power of the car.

B. CRITICISMS OF RATING METHODS

Within recent years considerable criticism of the rate-making methods employed has developed, directed against all three of the

[1] Rates change frequently, of course, and it is impossible to tell how long the illustrations used will be current.

fundamental factors upon which liability and property damage rates are based.

TABLE III

Horse-power	Liability	Property Damage
16	$22.50	$ 5.65
20	34.50	8.65
25	46.50	11.65
30	56.50	14.15
35	61.50	15.40
40	66.50	16.65
50	76.50	19.15
60 and over	86.50	21.65

1. *Motive power.*—Because of their relatively small number little attention has been given to rates on electric cars, and the problem of differentiation in premiums between these and gasoline cars has never attained any prominence. The principal question is whether sufficient experience records are available to support the rates which have been promulgated. No one denies that the electric-motor rates should be less than those for gasoline cars, as shown in the figures cited, but the proper extent of difference is disputable. The rate schedules indicate that the electric-car rates are roughly about 25 per cent of those on 40-horse-power gasoline cars in Greater New York. With the least attempt at refinement of analysis, however, the available statistics are inadequate, as far as can be ascertained; rates have in the past been made largely on the basis of underwriting judgment.

2. *Territory.*—As stated, rates have varied in accordance with the locality in which the machine was principally used. Thus the recent public liability rate in Greater New York territory on a 40-horse-power car was $17.00 higher than on the same car in Chicago, and the property damage rate in the former territory exceeded that in the latter by $4.25. It is undoubtedly true that by reason of traffic conditions the average hazard in New York is greater than in Chicago, but it may also be said that it is doubtful if the data available are of sufficient scope to determine the extent to which New York rates should exceed Chicago rates. The owner of an automobile in New York may admit that he should

pay a higher rate than the owner of a similar car in Chicago, but deny that he should be charged as much as $17.00 extra. Thus far the companies have not been in a position to refute his denial by the production of statistical proof of the relative extent of hazard in the two localities. In brief, the problem of fixing rates in insurance involves the statistical problem of accumulating sufficient experience to produce dependable averages. The present extent to which this has been accomplished may be judged by the fluctuations in Chicago rates; the public liability rate on a 40-horse-power car appears to have been $86.00 in December, 1913, and to have successively declined to $73.50 in the early part of 1915 and to $66.50 later in the same year.[1] It is conceivable, but not probable, that this decrease is partly attributable to a reduction in expense; the greater likelihood is that a considerable margin of safety was allowed during the infancy of the business and that later experience justified a decrease.

The making of rates on the basis of the locality in which the car is supposed to be principally used has resulted in some very peculiar situations. There will be found instances of two persons living in close proximity on opposite sides of the imaginary line bounding a rate zone. One very fortunately lives just outside the higher-rate zone, while the other unfortunately lives just inside this zone. As a concrete illustration an owner of a 30-horse-power car in Port Chester, New York, would pay $50.50 for public liability insurance, while an owner fortunate enough to live at Greenwich, Connecticut, four or five miles farther from New York City than Port Chester, would obtain a rate of $37.25.[2] As a result of such a system of rate-making the owners of motor cars who found themselves just inside the higher rate-zone line have always been dissatisfied. Some allowance in rates is justifiable, nevertheless, for cars operated in suburban or rural territory, and, no matter where the imaginary zone boundary line is drawn, persons located just within it will strenuously complain. Some territorial grouping

[1] See the rate schedules of 1913 and 1915 and the *New York Journal of Commerce*, August 18, 1915.

[2] Connecticut is said to have enjoyed at one time a rate even lower than the one quoted.

must continue to exist and individual injustices must be ignored so that substantial equity may be done. It would seem desirable, however, that some method be devised of reducing the extent of such discrimination.

3. *Horse-power.*—Insurable horse-power as a factor influencing rates has probably received greater criticism than either the motive power or the territorial distinctions, and with less justification. The most powerful and, in fact, conclusive criticism, were it true, is that potential horse-power is valueless as an index of the probability of injuring persons or damaging property because of the legal limitation of speed. Thus almost any private pleasure car can attain a speed of 30 miles per hour and greater speeds are almost universally prohibited by law, which, it is argued, places practically all cars upon an equal basis. Two methods of refuting this contention may be employed, however. In the first place, the mere existence of a law regulating speed is no assurance of its enforcement. Secondly, probably the most satisfactory statistics for automobile rate-making are those which justify the horse-power basis. The accompanying diagram[1] (Fig. 2) gives a picture of the liability and property damage experience on groups of cars of varying horse-power; the regularity and correlation of the curves are to be noted, as well as the rising loss cost with the increase in horse-power.

Another adverse criticism of the horse-power rating-basis is that high-power cars are usually also expensive cars and, as such, are on the average more carefully driven, among other reasons, because of the employment of professional chauffeurs. While there is some difference of opinion on this matter it is frankly admitted by those interested in automobile rates that it would be desirable to have some method of making allowance for competent operation, but the practical difficulties involved appear to be insuperable. A car is driven, not only by the chauffeur employed, but also by the owner, his family, relatives, and even friends. It is impossible to devise any satisfactory system of rating drivers, for, even assuming that a personal-rating system was operative, the insurance might

[1] The figures from which these curves were constructed are purposely omitted, having been given confidentially.

be procured by one person and the driving performed by another, or fraud readily practiced by means of assumed names.

Thirdly, it is indicated that a very important element is omitted from the bases for rates, namely, the distance the car is run. Assuredly, the greater the mileage covered by a car, the greater the possibility of accident, and the higher the rate should be. This is

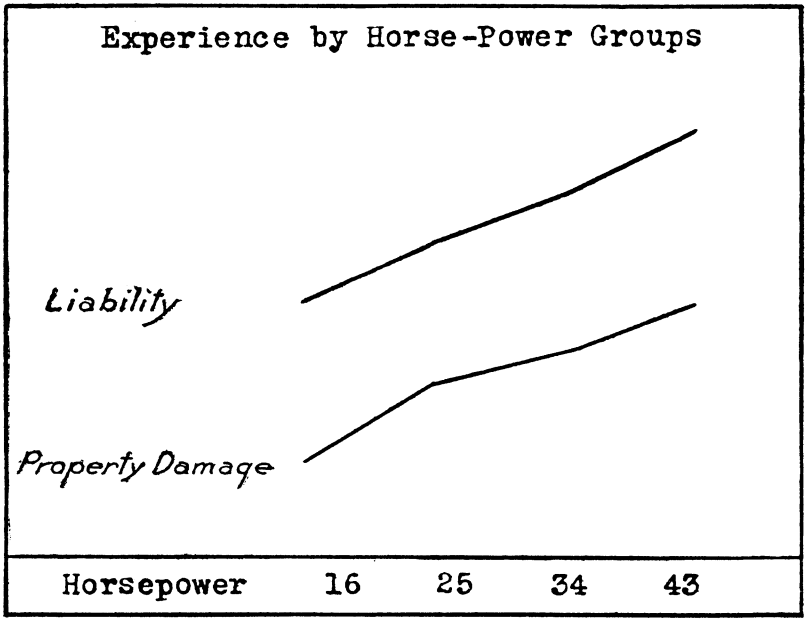

FIG. 2

generally acknowledged as a correct contention, but affords another illustration of the practical difficulties encountered in automobile insurance rate-making. Instances of falsifying speedometer records as an assistance in tire claims are not unknown, and until a mechanism which cannot be tampered with or destroyed is invented the influence of mileage will remain incalculable.

Lastly, it is to be noted that the insurable horse-power used as a basis for rating is derived from the formula of the Society of Automobile Engineers, which takes account only of bore and of number of cylinders. Because of differences in length of stroke and

type of motor this formula is far from being an accurate measure in every case of the actual power of an engine. Two illustrations will be sufficient to demonstrate this. The Ford $360 car and Hupmobile $1,185 car are both four-cylinder motors with a $3\frac{3}{4}$-inch bore and both have the same horse-power rating. The former, however, has a 4-inch stroke as compared with a $5\frac{1}{2}$-inch stroke for the latter. This fact necessarily makes some difference in actual horse-power. The manufacturers of the Hudson claim to have increased the power 80 per cent over the former engine without any increase in size in a car known as the "Super-six." Both cars, however, have the same horse-power rating.

C. COLLISION INSURANCE

In collision insurance, which indemnifies for damage to a car by collision with other objects, the contract usually takes the form of a clause indorsed upon a liability or a fire and theft policy. Two types of indorsements are in use: the "Twenty-five Dollars Deductible Coverage" and "Full Coverage" clauses. The latter places no limit upon the company's liability, while under the former the insured must himself bear $25 of any loss.[1] Because of the predominance of small losses and questionable claims the "Full Coverage" contract is considerably more expensive. In the same collision premium class (A) full coverage costs $63.00 as compared with $28.00 for deductible coverage. The former is thus almost prohibitive.

1. *Basis of rates.*—Collision insurance rates on private pleasure cars are based upon the list price of the car. According to its list price the car is placed in one of a number of classes lettered from A to Z, the former representing the lowest list-price class. Rates for all territories are the same and for deductible coverage range from $28.00 to $200.00. This system presupposes that the extent of damage from collision is likely to vary with the expensiveness of the car. For example, the scraping of the poor finish on the side of a cheap car would be negligible, while it would detract considerably from the value of a costly, highly finished machine.

[1] Another variety exists similar in principle to the "memorandum" clause in marine insurance.

2. *Criticism.*—The principal criticism of the collision rate system is that the list-price basis causes the higher-priced cars to pay excessive rates. It is argued that these cars usually have their hazard considerably reduced by the fact that they are ordinarily better driven and have less hard usage. This brings up again the problem of rating drivers, with all its practical impossibilities. Another defect is that no consideration is given to the variation in the accident rate with different localities.

IV. FIRE AND THEFT INSURANCE

A. DEFINITION

Insurance on motor cars written by fire and marine insurance companies provides indemnity for losses incurred from fire, explosion, lightning, land and marine transportation perils, and theft. Collision insurance is also furnished by these companies by the indorsement of a collision clause.

B. RATE BASES

1. *Territory.*—For purposes of rate-making the country is under the jurisdiction of a number of conferences which are members of the national conference. Their territories were previously shown. Largely because of local conditions, including competition and the failure to combine experience, the rates for the various conferences are not uniform. Thus on the same type of car the rate for "non-valued" fire, theft, and transportation coverage in Chicago is $3.50, on the Pacific Coast $2.25, and in Eastern and New England Conference territory $2.50 for each hundred dollars of insurance. The fire and theft rate on similar cars in Virginia is $3.00 and in other Southern territory $3.25. Texas and Mississippi are virtually exempt from Conference authority because of the existence of anti-compact legislation.

2. *List price.*—Cars are grouped according to list price in lettered classes, Class E including cars listed at $799 and under; Class D, cars listed at from $800 to $1,399; and thus to Class A, comprising cars at $3,500 and over. Class E rates are the highest, $5.00 for this year's model in Chicago territory; Class D, $3.50; Class C, $3.00; Class B, $1.75; Class A, $1.50. Class D cars will be used

for purposes of illustration here. The list-price basis has been employed on the assumption that the more valuable the car the better the care taken of it, the smaller the moral hazard, and the more insignificant the danger of theft. The comparatively great theft loss on common cars of low price, which can be readily disposed of with few questions asked, is too well known to require more than mention.

3. *Model.*—The rates quoted above are all on cars of this and next year's model; the older the car, the higher the rate. Thus cars of this year's model are rated at $3.50 in Chicago, last year's models at $4.00, and those older than three years at $5.75. In addition, the amount of insurance on cars more than six months old is limited. In Chicago Class D cars from six to eighteen months old are not insured for more than 60 per cent of the original list price, and models three years old and more for not more than 30 per cent of the list price. The following assumptions underlie this method: (1) the physical hazard is affected by the price of the car because the cheaper the car, the poorer the construction; (2) on cheaper cars an unintentional moral hazard is created by lack of care; and (3) the value of the automobile is supposed to be an index of the financial condition of the owner. The restriction as to the amount of insurance on cars of other than the present model is imperative because of the peculiarly rapid depreciation on automobiles. A car is said to lose 25 per cent of its value as soon as it leaves the salesroom, and within a few years it may not be worth one-third of its original cost. The underwriters must necessarily guard against insuring for a greater sum than a car would bring second hand; otherwise a moral hazard would be created.

4. *New and second-hand cars.*—The remarks just preceding apply also to the distinction made in rates between new and second-hand cars. On a Class D car of this year's model insured within six months of time of purchase by the original owner the rate in Chicago is $3.50, while a person acquiring the car from the original owner would, under similar circumstances, be charged $3.60.

5. The companies differentiate between electric and gasoline cars. Thus on the Class D gasoline car just mentioned the rate was $3.50, while similar insurance would be given on an electric vehicle for $1.00.

C. CRITICISM OF RATES

The criticism of fire and theft rates, briefly stated, is on grounds of the lack of statistical support and consequent inability on the part of the public to ascertain whether the rates are just and equitable or exorbitant and discriminating. In 1911 an investigator of the New York Insurance Department stated: "As yet the Conference has gathered no statistics, nor does there appear to be a clearly defined plan as to the nature of the statistics to be gathered or the methods to be employed in gathering them. Such rates as were originally adopted and the changes that were subsequently made in them appear to be based rather upon 'underwriting judgment' than upon actual figures obtained from the different companies writing this class of business." In 1917 a similar report[1] stated that "none of these rates were based upon statistics gathered for the purpose, although the experience of individual companies was used. And there are no records or statistics in the files of the conference which would indicate whether these rates were equitable or just."

It is not necessarily to be inferred that the described deficiencies in rating have been brought about by design. In nearly every form of insurance a beginning had been made with a rough grouping such as is evident in automobile rating, and in some cases with a much cruder system. The complaint which the public may justly urge with the greatest force is the lack of co-operation which has existed among the companies in the past. More or less unrestrained competition not only made combined experience difficult to obtain, but frequently caused the published rates to be merely nominal. The defects of the system are obvious, and until some constructive, rather than critical, ideas are advanced little improvement can be expected.

V. PROPOSED MODIFICATIONS IN AUTOMOBILE RATE-MAKING

It is evident from what has been said that two modifications in the methods which have been employed in making rates are desirable, the first involving the statistical problem of accumulating and handling experience data, and the second consisting of an improved

[1] *Reports on Examinations of the Automobile Underwriters' Conference, New York Insurance Department*, 1911 and 1917.

theoretical basis for rate-making. Steps are now being taken to improve the statistical basis for rates, but the solution of the second problem is progressing slowly, if at all.

A. PLANS FOR THE COLLECTION OF EXPERIENCE

A large volume of dependable data being a necessity, the statisticians of the National Workmen's Compensation Service Bureau have prepared a method for the collection and reporting of experience by its member companies under standard rules of procedure, a call to be made for this material in the early part of 1919. Variations in methods of compilation have hitherto created difficulties, even in dealing with what data were obtainable. Under the proposed system, which goes into effect for the policy year 1917, all experience data are to be based upon the year of issue of the policy, regardless of the time of receipt of the premium or the payment of loss. Because of the fact that some policies are not written until the latter part of 1917, it will be necessary to wait until December, 1918, before turning in all 1917 experience. Even then there will be outstanding losses to be considered, for liability suits sometimes require considerable time for adjustment or decision. The companies may adopt any method they see fit in compiling the information required, but reports to the Bureau must be in accordance with the prescribed plan.

Difficulty has been experienced because of the methods followed by some companies in treating insurance for a fraction of a year. The new plan provides a unit of a "car year" and requires that insurance for less than twelve months be reported as a corresponding fraction of a car year. Thus one car insured for six months would be reported as five-tenths of a car in liability and property damage insurance. In collision insurance risks of less than one year are to be reported as fractions of the list price; thus one month's insurance on a $1,200 car would be reported as $100 of insurance. It was deemed best in collision insurance not to attempt to collect two kinds of exposure—list price and number of cars—and the latter is consequently made optional with the companies, although advised by the Bureau.

Under this plan it will be necessary for the members to furnish the Bureau with the exposure, premiums, and losses, together with

such a description of the risk as will enable segregation of the data according to (1) form of coverage, whether liability, property damage, or collision insurance; (2) type of car, whether private pleasure, private pleasure occasionally commercial, commercial, livery, public other than livery, manufacturers' and dealers' on named-chauffeur or specified-car basis, or manufacturers' and dealers' on pay-roll basis;[1] (3) motive power, whether gasoline, steam, or electric; and (4) classification of the car according to horse-power groups in liability and property damage insurance, and according to list-price groups in collision insurance.

Experience for the country as a whole is to be reported so as to permit of complete analysis as reported above. In addition it is necessary to require that data be reported by individual states and territorial divisions to permit adjustments of rates with reference to the relative hazard of the different rate groups. Inasmuch as the detailed analysis of experience proposed for the country as a whole would, in the case of a single state, reduce the exposure below the volume necessary for an average, it is planned to collect data by territorial groups in accordance with only the first three subdivisions named (form of coverage, type of car, and motive power), omitting classification of cars within the type.

It would then be possible to construct a system of rate-making similar to the differential plan employed in compensation insurance[2] or the method followed in the fire insurance "Experience Grading and Rating" schedule.[3] Under this plan it is assumed that any relations which may be developed from an analysis of national experience as regards, for instance, horse-power groups or list-price groups will hold true also for individual states, cities, and territorial rate groups, it being impossible to derive such relations from the territorially classified data because such data will not provide a sufficient exposure under each group. Thus if national experience shows that liability rates on cars of from 31 to 40 horse-power should be 2 per cent higher than rates on the 21- to 30-horse-power group, it may be assumed that this ratio is also equitable within any particular

[1] It will be noted that the classifications of type of car have been increased from four to six.

[2] See C. E. Scattergood, *Synthesis of Rates for Workmen's Compensation.*

[3] E. G. Richards, *Experience Grading and Rating Schedule*, New York, 1915.

territory. Probably in each particular rate group the number of insured 31- to 40- and 21- to 40-horse-power cars would be found insufficient for a dependable average. Likewise it will be assumed that if, from the individual territorial groups' experience, it can be determined that private pleasure cars in Greater New York should be charged more than the same cars in Chicago, this will hold true of all cars, regardless of their horse-power. This is merely an application of the statistical principle that no average should be based upon insufficient data.

A code has been prepared to enable the companies, if they desire, to make use of punched cards in connection with the Hollerith or Powers sorting and tabulating machines.

The plan for collecting uniform liability, property damage, and collision insurance experience having been described, little space need be devoted to the National Automobile Underwriters' Conference plan for fire and theft insurance, which is very similar. Insurance written and losses are to be reported, with details as to location of the risk, by states or cities; type of coverage, whether fire, theft, transportation, or a combination of these coverages, and whether written on a valued or non-valued form; year of model, whether next year's, this year's, last year's, etc.; make of car; list-price class; motive power; ownership, whether new or second-hand; use of car, whether private pleasure, livery, etc.; presence of safety appliances, etc. With this information available it would be possible to proceed to construct fire and theft rates in accordance with the principles described under the liability, property damage, and collision plan.

B. SUGGESTED CHANGES IN LIABILITY AND PROPERTY DAMAGE RATING

It is a difficult matter to propose changes in existing rate-making methods which meet practical conditions, but the attempt may be made with the hope that the inevitable criticisms will themselves be productive of improvements. It will appear to anyone from a study of automobile rates that modifications are desirable which would produce (1) a reduction of discriminations, which are unavoidable under the present territorial divisions, (2) a consideration of certain admitted factors of hazard, which at present have no influence on rates, and (3) a system of equitably allocating expenses.

1. The defect of the present system of rating is that at the boundary line of the state or other territorial division the rates change much more abruptly than hazards. The same trouble, for example, would ensue in the parcel-post system if a flat rate existed outside of the local zone, or in the express-rate system if the blocks were too few in number. One method of reducing the inequity of such abrupt transitions in automobile insurance would be to increase greatly the number of rate zones without reducing, below a point sufficient for an average, the exposure upon which rates are based. It is believed that this might be done without such fatal result and without enormously increasing the necessary number of rate schedules by the following method:

Every large city in the United States of over 55,000 inhabitants should be considered as the center of a series of rate zones, the city itself (approximately) forming the highest of these zones. It would then be necessary to obtain a basis rate for liability and property damage insurance for each of these cities—a rate which would cover merely the losses incurred, or, in other words, provide the amount actually returned to policy-holders. Such a rate is obtainable by comparing the ratio of losses to exposure on all private pleasure cars in the *particular city* with the ratio of losses to exposure over the *entire United States*. The particular city's rates would then be in proportion to the average rate of the United States as its loss ratio is to the average loss ratio of the United States. Thus, to use figures, if the Greater New York liability loss is on the average $40.00 per car insured twelve months, while the average loss in the United States is $30.00 per-car year, the rates in New York will be 133 per cent of the average rates of the United States.

It would seem from this that it would be necessary to construct a vast number of rate schedules in order to cover all the large cities in the United States. Two facts operate, however, to reduce the apparent magnitude of the task. First, the number of cities of over 55,000 inhabitants in the United States is only about 100, according to the 1910 census. Secondly, while it may be necessary for a time to carry nearly 100 schedules, this number may be considerably reduced if a reasonable coincidence of experience is discovered among these cities, which will permit of grouping. Grouping may also be necessary where insufficient exposure is found.

There still remain to be considered the cities of less than 55,000 inhabitants. These are so numerous and the possible exposure in each is so small that the construction of separate rate schedules for them is impossible. Consequently they will be grouped in a class, and a rate made for the class in the same manner that a rate was arrived at for the larger cities. This will not do absolute justice among such smaller cities and towns, inasmuch as a city of 50,000 will obtain a rate equally low with a town of 5,000, but it will be 100 per cent superior to the present system, under which a city of 100,000 and one of 5,000 frequently find themselves on equal terms.

We have now to consider the territory outside of cities, including suburban and rural districts. It is proposed that each of the cities be considered as surrounded by a series of concentric circles, with the geographic center of the city as a common center, the circumferences of the circles being considered as the boundary lines of rate zones. Thus, using New York as an illustration, the greater part of the city would be circumscribed by a line, say, 25 miles distant at all points from the city's geographical center and forming a circle 50 miles in diameter. All cars within this zone would take the Greater New York rates, which will vary of course with the horse-power. Outside of it would appear another imaginary circle with a diameter of, say, 55 miles, and all cars between the circumference of this circle and the one first mentioned would take a rate which would be a percentage of the rate for the city zone and lower than the latter by, say, 5 per cent. It may be assumed with some degree of equity that, beyond a certain point, the farther a car is kept from the city, the less it will be used within the city limits. The loss experience of a number of larger cities might be used to determine upon a statistical basis what the percentages of the various zones should be, and their diameters. There would be many cases in which the location of the automobile would fall within two zones of different cities, and under such circumstances the higher rate of the two would be charged.

Such a system of adjusting rates to location would have the following points in its favor:

a) The assumptions upon which it is based may be more readily defended upon theoretical grounds, admitting of some explanation to the insured of the causes of rate differences.

b) It would lessen the effect of discriminations which inevitably result from the present territorial divisions, such as a distance of a half-mile causing a $5.00 difference in property damage rates or a $23.00 difference in liability rates.

c) It would eliminate the anomaly of cities with 5,000 and 100,000 inhabitants having the same rates.

2. Some consideration should be given to certain factors of hazard which now have no influence on rates, such as (1) mileage covered and (2) competent driving. We reach the general conclusion regarding these factors, however, that a number of desired results in rate-making are unattainable or are not worth the trouble involved.

3. Finally, some method of accurately ascertaining the expense involved in connection with all forms of automobile insurance is necessary. The public is entitled to know that each line of coverage is bearing its equitable portion of the total cost of doing business. Considerable criticism of the percentage of premiums devoted to expenses exists and has even led to the establishment of so-called automobile mutuals. A more fundamental inquiry, however, is whether automobile insurance is being charged with more than its share of total expenses, and whether liability and property damage insurance are each bearing their appropriate portions of the expense burden. This question has already been discussed by an able writer on casualty insurance,[1] who has proposed an efficient cost system for companies writing multiple lines. His plan is described for the benefit of those companies "transacting multiple lines of insurance which desire . . . . enlightenment and guidance to ascertain as close an approximation as possible to the true cost of conducting *each* of its lines." This expense problem appears to be second in importance only to the improvement in methods of ascertaining pure premiums in automobile insurance.

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[1] C. E. Scattergood, "Cost Accounting in Casualty Insurance," *Proceedings of Casualty Actuarial and Statistical Society*, Vol. II, Part II, No. 5.